

# IR and Thermal Image Characteristics

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## Abstract

*Infrared imaging cameras are non-contact devices that detect infrared energy, or heat, convert this measure into an electronic signal, and then process this information to produce a thermal image. The amount of heat detected by an infrared camera can be accurately quantified to calculate temperature differences in addition to producing clear thermal images in low-light situations. Infrared cameras can be used in a wide range of settings and offer end users a number of benefits, especially with recent innovations that have made infrared technology more practical and valuable than ever before. Choosing the method of segmentation depends strongly on the type of the image, IR one is more sensitive to the content. Infrared imaging cameras are instrumental in identifying and quantifying heat sources. This has a wide range of uses in the construction, agriculture, security, and surveillance industries. Infrared cameras can be used in a wide range of settings and offer end users a number of benefits, especially with recent innovations that have made infrared technology more practical and valuable than ever before.*

**Keywords:** IR, Thermal, imaging.

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## INTRODUCTION

First and foremost, the biggest benefit of infrared cameras is their ability to operate in low-light conditions where cameras with normal CCD or CMOS sensors would struggle. This is particularly useful for security and surveillance, as night time conditions have no impact on the amount of energy an infrared camera detects. Further, infrared imaging cameras can have explosive return on investment (ROI), even when compared to typical machine vision systems. In the example outlined above, a company could save an enormous amount through avoided downtime, repair costs, and the costs of new equipment. These costs pale in comparison to the cost of an infrared imaging camera, creating incredible ROI. Infrared imaging is unique in function when compared to traditional machine vision systems, but they have their own benefits in specific applications. Infrared cameras are highly adept at detecting infrared energy for imaging beyond the visible spectrum of light. While thermal and infrared systems are deployed in a wide range of settings, there are fundamental advantages that non-visible imaging solutions have over visible imaging solutions.

Infrared and thermal imaging systems perform well in low-light and low-visibility situations. This is critical for outdoor applications where light and visibility are a constant variable, and especially useful in security applications—no camouflage will fool a thermal camera. Infrared and thermal cameras can also be used to measure temperature differences, which is critical for monitoring critical equipment. For example, a thermal camera can monitor electrical equipment—which heats up before it fails—to signal when maintenance or replacement is required. Thermal and infrared image systems provide great return on investment (ROI) in most applications. In the examples above, keeping a location safe and secure, or avoiding a catastrophic equipment failure, can lead to rapid ROI. Thermal and infrared cameras, with their better performance in low-light situations, often require less initial investment too, as fewer cameras can be used. All of this adds up to reliable ROI. Infrared and thermal imaging systems have become a common solution for security, surveillance and monitoring applications, among others. Advancing technology, decreasing costs and fundamental advantages over visible imaging solutions in certain applications have all led to the growing use of infrared and thermal imaging systems.

## HOW THERMAL IMAGING CAMERA WORKS

Let us understand working of thermal imaging camera.

- Infrared energy coming from object is focused by optics onto an infrared detector.
- The detector sends this received information to sensor for image processing using complex algorithms.
- The sensor translates this data into an image which can be viewed on LCD screen of the thermal imaging camera.
- Each pixel of image is measure of temperature at different points. For example if resolution of image by camera is 60 x 60 pixels, then it is equivalent to use of about 3600 Infrared thermometers used simultaneously.

Following specifications are critical in selecting thermal imaging products.

- Temperature range
- Thermal sensitivity or NETD (Noise Equivalent Temperature Difference)
- Resolution

## ADVANTAGES OF IR/THERMAL IMAGING

Where expectations are already high, Red Current provide an exceptional service that is non-invasive but extremely cost-efficient. Here's how you can benefit from our thermal imaging cameras and surveys today!

### 1. Uncovering hidden issues

Thermal imaging is an advanced technique that can indicate many potential defects within the heat spread across a building. If there are any air leaks whatsoever, a thermal imaging camera from Red Current can highlight these for you, ensuring your building's heating economy is maintained.

To detect air leaks, it's recommended you check around the roof, windows and doors for changes in temperature, identifiable by their colours; a clear indication of where air is escaping.

### 2. Perform home inspections

A thermal imaging survey allows you to identify any problems with the transfer of heat within your home. If your property is losing energy easily, it's likely that your electricity bills will be exceedingly high but using thermal imaging, you can pinpoint where energy is being lost so you know which areas need attention and repairs.

The fact that the thermal imaging cameras are portable make them ideal for assessing moisture damage and the severity of it. A Red Current thermal imaging report provides you with greater convenience and reliability regarding the structure of your property.

### 3. Detection of electrical faults

It's better to detect the signs of electrical failure before it's too late!

Thermal imaging can allow you to identify overloaded or overheating circuits or whether a motor bearing may have failed, ultimately enabling you to repair any faulty electricals before they cause damage to your property or indeed harm to occupants.

Undetected electrical faults will likely lead to power failure and the last thing you want is for your power to cut out. Thermal imaging is advantageous in the sense that you can repair any faulty equipment or electricals within your property in good time, before it gets too expensive!

#### 4. Speed of response

If you require any information regarding thermal imaging, Red Current are always on hand to provide expert advice. The thermal imaging equipment we have available is ideal for detecting a wide range of faults within your home or office space, identifying faults quickly and efficiently, saving you both time and money.

When hiring any of our thermal imaging cameras, we guarantee free UK next day delivery and return collections so you only pay for the period of hire! The cameras require no downtime and are convenient and effective, allowing you to visualise the areas that need repairs.

#### 5. Lightweight

Red Current believe that thermal imaging is suitable for any industrial application. Being lightweight and portable in design make the cameras perfect to move around with ease during entire building inspections speeding up the process and ensuring a high degree of accuracy in your results.

#### 6. Don't waste your money

Thermal imaging may seem expensive but you will find it is significantly cheaper than the cost of escalating energy bills and repairs which could have been prevented prior to a failure occurring!

A thermal imaging survey will enable you to address areas where money is being wasted and so ensuring that your precious money is being spent wisely, making your industrial building or home as cost and energy efficient as possible.

### DRAWBACKS OR DISADVANTAGES OF THERMAL IMAGING

Following are the drawbacks or **disadvantages of Thermal Imaging**:

- Thermal imaging products require high initial investment cost.
- Images are difficult to interpret in specific objects having erratic temperatures.
- Accurate temperature measurements are hindered by differing emissivities and reflections from surfaces.
- Thermal imaging cameras are not used for study of under water objects.
- Most of the thermal imaging cameras have +/-2% accuracy or worse for temperature measurement and are not as accurate as contact methods.
- Thermal imaging cameras can not see through glass as thermal energy can be reflected off shiny surfaces.
- Moreover these cameras can not see through walls.

### Conclusion

This paper mainly focus on IR and thermal imaging concept with advantages and disadvantages. It can be used develop more accurate image recognition system.

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